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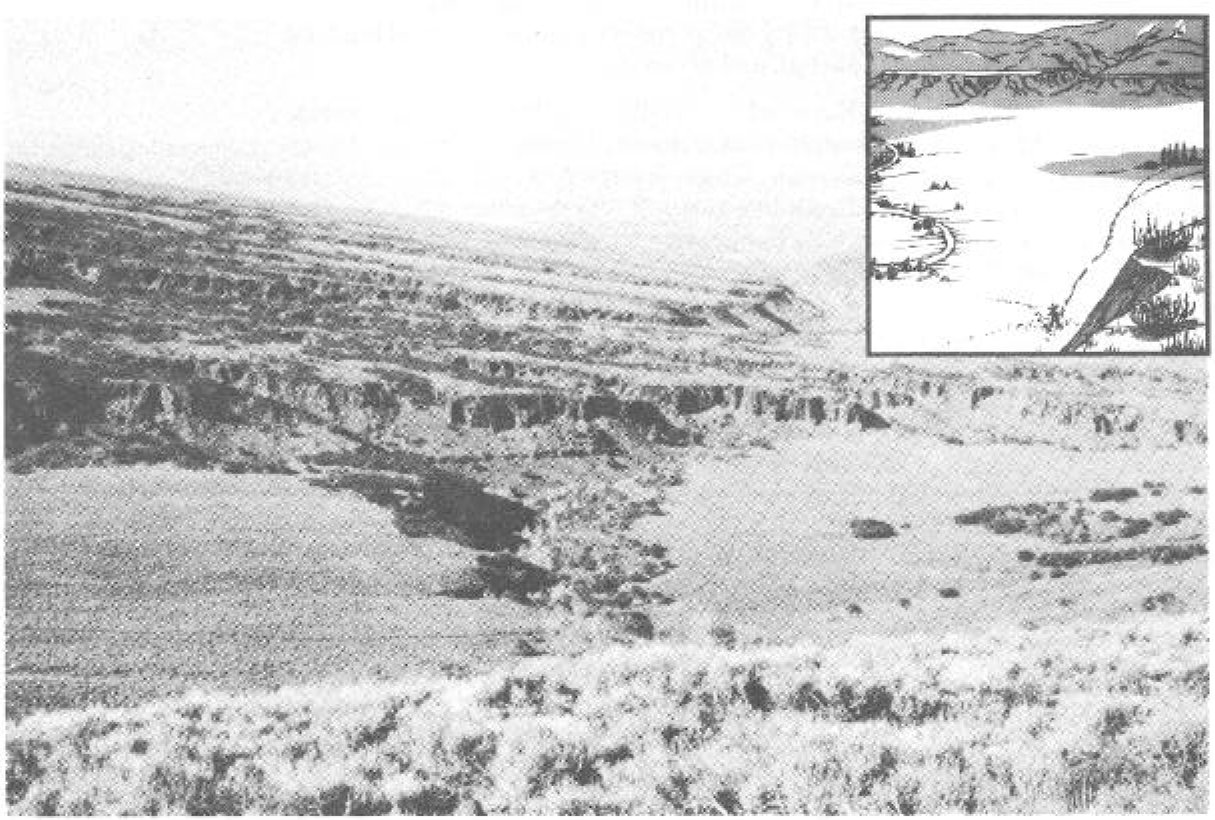
WILDLIFE HABITATS IN MANAGED RANGELANDS-- THE GREAT BASIN OF SOUTHEASTERN OREGON

Management Practices and Options

FREDERICK C. HALL



PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
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Abstract

Management practices and options to provide habitat for wildlife in the Great Basin of southeastern Oregon deal with both vegetation treatment and protection, livestock management, maintenance or distribution of water developments, protection of wildlife areas through road closures or fencing, and direct manipulation of wildlife through hunting, trapping, or other means.

This chapter deals primarily with livestock management in relationship to wildlife and wildlife habitat. Included are discussions of ecological status (range condition), livestock management, multiple-use options for each species featured in previous chapters (trout, sage grouse, pronghorn, mule deer, and bighorn sheep), and diversity.

Keywords: Wildlife habitat management, range management, livestock, Oregon (Great Basin), Great Basin–Oregon, series (Great Basin habitats).

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This publication is part of the series **Wildlife Habitats in Managed Rangelands–The Great Basin of Southeastern Oregon.** The purpose of this series is to provide a range manager with the necessary information on wildlife and its relationship to habitat conditions in managed rangelands to make fully informed decisions.

The information in this series is specific to the Great Basin of southeastern Oregon and is generally applicable to the shrub-steppe areas of the Western United States. The principles and processes described, however, are generally applicable to all managed rangelands. The purpose of the series is to provide specific information for a particular area and in doing so to develop a process for considering the welfare of wildlife when range management decisions are made.

The series is composed of 14 separate publications designed to form a comprehensive whole. Although each part is an independent treatment of a specific subject, when combined in sequence, the individual parts are as chapters in a book.

A list of the publications in the series and their final organization is shown on the inside back cover of this publication.

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Introduction

Management practices and options to provide habitat for wildlife in the Great Basin of southeastern Oregon deal with both vegetation treatment and protection, livestock management, maintenance or distribution of water developments, protection of wildlife areas through road closures or fencing, and direct manipulation of wildlife through hunting, trapping, or other means.

The degree of emphasis given to wildlife objectives must be clearly defined. If wildlife are of major concern to managers, livestock grazing is used to help produce a desired habitat condition. More commonly, wildlife targets are among several objectives to be produced from the same land base under the multiple-use philosophy of land management. Tradeoffs must be made between maximum production of livestock and the best possible wildlife habitat conditions.

Objectives may be stated for individual wildlife species (featured species management), for maintenance of a diversity of species (species richness management), or for a combination of the two (Maser and Thomas 1983).

This chapter deals primarily with livestock management in relation to wildlife and wildlife habitat. Included are discussions of ecological status (range condition), livestock management, multiple-use options for each species featured in previous chapters (trout, sage grouse, pronghorn, mule deer, and bighorn sheep[1]). The chapter concludes with a discussion of diversity.

Ecological Status

Ecological status compares vegetation currently on a site with the vegetation that would occur if there were no fire or livestock grazing. The Society for Range Management (Range Inventory Standardization Committee 1983) defined ecological status as "the present state of vegetation and soil protection of an ecological site in relation to the potential natural community." Close livestock grazing often causes current vegetation to be different from the PNC.

This concept is based on the PNC (potential natural community) that will occupy a specific site in the absence of fire or livestock grazing. When livestock graze, they forage first on the more palatable plant species. If these plants are closely eaten during active growth, their ability to grow and reproduce is seriously reduced. They eventually die, which results in a change of species in the plant community and a general decrease in forage production (fig. 1). Such changes are called range trend; a change away from the PNC is termed "downward trend," which is usually caused by close grazing; a change toward natural potential, called "upward trend," results when livestock are managed so that they graze in a way that allows adequate growth and reproduction of palatable plants (Range Inventory Standardization Committee 1983).

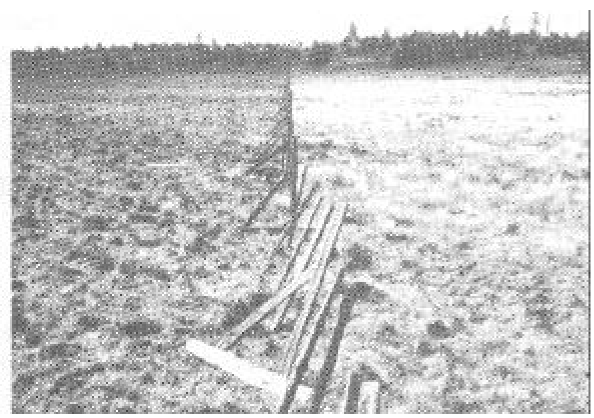

Figure 1.— Effects of livestock grazing on low sagebrush/wheatgrass plant community. Compare the potential natural plant community (left of fence) with the midseral stage (right of fence). Livestock overgrazed wheatgrass and caused it to decrease in density, which resulted in decreased herbage production.

[1]Common and scientific names are listed in the appendix.

The degree of change from the PNC is commonly identified by four condition classes: PNC, late seral, midseral, and early seral (Range Inventory Standardization Committee 1983). Potential natural community occurs when there are no significant changes caused by grazing. Late seral indicates that livestock have caused some change in the plant community and some reduction in forage production. Midseral indicates a major change in the plant community and low forage production. Early seral means that most of the palatable, native plants have been killed, forage production is very low, and adjustment of livestock grazing may not be a feasible means for attaining an upward trend (Range Inventory Standardization Committee 1983).

The Wyoming big sagebrush community is used here as an example of ecological status (fig. 2). Table 1 lists some common plant species and their crown cover that might be expected within the four condition classes. In PNC, bluebunch wheatgrass clearly dominates the herbaceous layer under a 12-percent crown canopy of sagebrush. Forage production averages about 600 lb/acre (672 kg/ha) per year, of which wheatgrass contributes about two-thirds. Wheatgrass plants are the most palatable, and they decrease in number and vigor when they are closely grazed. Forage production also decreases. At the same time, less palatable species, such as Sandberg's bluegrass and needle and thread grass, increase, which changes the condition to late seral. With continued close grazing, even these less palatable plants are overused and begin decreasing as did wheatgrass. In the midseral condition, only vestiges of wheatgrass are present and forage production falls to one-third of the potential.

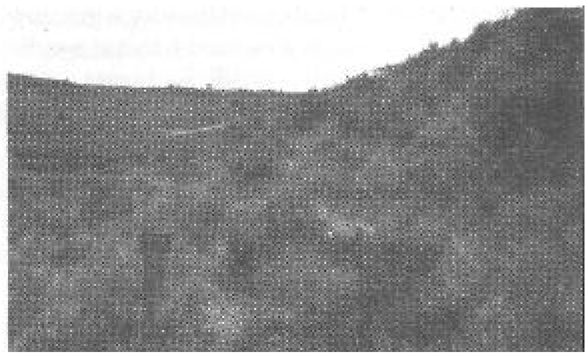

Figure 2.— Wyoming big sagebrush/wheatgrass community used as an example for ecological status.

Table 1—Ecological status classes in the Wyoming big sagebrush plant community[1]

	Condition classes, by crown cover			
Plant species	Potential natural community	Late seral	Midseral	Early seral
	Percent			
Wyoming big sagebrush	12	14	16	18
Bluebunch wheatgrass	10	7	4	—
Needle and thread grass	2	3	2	—
Sandberg's bluegrass	5	7	5	2
Forbs	5	6	7	5
Cheatgrass brome	1	3	7	10
	lb/acre (kg/ha)			
Forage production	600 (670)	400 (450)	200 (225)	100 (110)

[1]Based on Range Inventory Standardization Committee (1983) criteria: Potential natural community is 75 percent or more of the ecological site potential; late seral, 50-75 percent; midseral, 25-50 percent; and early seral, 0-25 percent.

Nearly all native, palatable species may eventually be killed, which would leave the introduced annual cheatgrass brome as the primary forage producer in the early seral condition. In this plant community, the crown cover of sagebrush increases somewhat when the range trend is downward.

Sometimes the range manager's objective is to graze livestock in a manner that maintains the PNC or fosters an upward range trend toward it. At other times, existing vegetation may be manipulated to increase production of livestock forage. If sagebrush is killed in the Wyoming big sagebrush type, competition with grasses is reduced and forage production increases from an average 600 lb/acre (672 kg/ha) to about 1,100 lb/acre (1232 kg/ha). Under natural conditions, fire commonly reduces sagebrush.

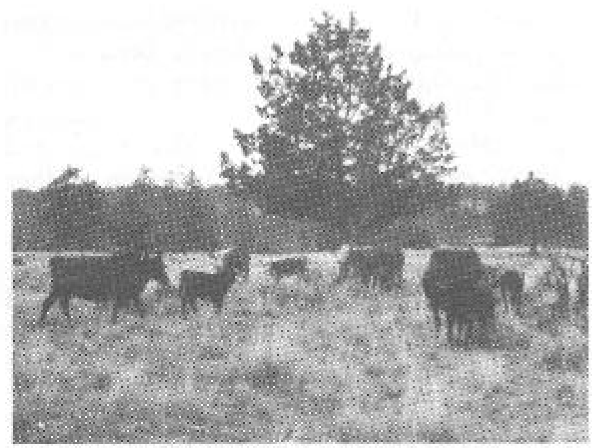

Figure 3. — One system of ranching in the Great Basin is a "cow-calf operation" where calves are sold in the fall after they are weaned. Distribution of cows with calves is influenced by water and by the thermal cover that may be provided by juniper trees.

In midseral and early seral conditions, cheatgrass brome is found in increasing abundance. Because it is an annual, yearly production is influenced mainly by growing conditions in the spring (Klemmedson and Smith 1964). High fluctuations in production are not conducive to sound ranch management. Therefore, crested or fairway crested wheatgrass, both perennial grasses, are commonly seeded after sagebrush is controlled. Like the native wheatgrass, they can produce 900 to 1,100 lb/acre (894 to 1232 kg/ha) of forage. Forage for wildlife, such as pronghorns, mule deer, and sage grouse, can be enhanced if adapted forbs are included.

Characteristics of Livestock Management

Livestock management deals with grazing the right kind of animals at the right place at the right time in the proper number. What is "right" depends on land management objectives (fig. 3).

Domestic livestock management directly affects wildlife habitat in two ways–the alteration of vegetation to enhance livestock forage, and the consumption of vegetation by livestock. Indirect effects on wildlife are caused by fences and water developments used to distribute livestock. These direct and indirect effects may cause competition for forage, create social interaction between livestock and wildlife, alter wildlife home ranges or territory through water development, introduce hazards or change wildlife use by fencing, and increase harassment from humans by roadbuilding. For a better understanding of livestock management, the following topics are discussed: behavior of livestock, livestock grazing systems, forage utilization, livestock distribution, and vegetation treatment to enhance livestock forage.

LIVESTOCK BEHAVIOR

Cattle ranching in the Great Basin usually concentrates on one of two age classes of livestock: cows with calves or yearlings. A herd composed of cow-calf combinations is often characterized by poor livestock distribution over the range because the cow is unwilling to travel long distances with a calf at her side (fig. 3). This is particularly important when water is poorly distributed because the cow needs abundant water for milk production. Cows are often retained in the base herd 6 to 10 years. Such cows develop traditional patterns of grazing that may not provide good distribution. In general, cows scatter over the range best in the spring and fall when the weather is cooler and less energy is dissipated in movement.

Yearlings distribute themselves better across the range than cows with calves do. Because they are relatively young, they have little knowledge of the range and scatter to explore new and different environments. The youth and vigor of yearling induces them to travel farther from water and on steeper and rockier slopes than cows and calves commonly do.

Cattle are primarily grass eaters, but they do consume forbs and shrubs, such as bitterbrush and mountain-mahogany. Because they have only lower incisors and comparatively thick lips, they ordinarily graze no closer than 1 to 2 in (2.5 to 5 cm) from the ground.

Domestic sheep, when accompanied by a herder, can be distributed in almost any way the land manager desires. They can be managed in open herds with a "once over" grazing system resulting in almost imperceptible use. Or they can be tightly herded with two or three passes over the same area resulting in very close use. The method of herding and degree of utilization is at the discretion of the land manager. In general, sheep prefer forbs and, because of their small mouths and thin lips, easily crop vegetation to within 0.5 in (1.3 cm) of the ground. They can negotiate steeper and rockier topography than cattle can.

Horses are the most selective feeders among livestock, whether wild or domesticated. Grass is eaten almost exclusively, but most unevenly. Horses repeatedly graze the same grass plants and leave adjacent ones untouched. With incisors in both upper and lower jaws, they easily crop vegetation to within 0.5 in (1.3 cm) of the ground. This produces extremely uneven grazing of grasses and kills certain grass plants and leaves others of the same species untouched. Horses distribute themselves well across available rangelands because they often move long distances from water to feeding areas.

GRAZING SYSTEMS (CATTLE AND SHEEP)

Livestock grazing systems are characterized by season, frequency, and intensity of use. Grazing intensity, often measured by how close to the ground (stubble height) vegetation is used, varies greatly and is hard for managers to regulate. The objective is to confine the right animals in the right place at the right time in the proper numbers to attain the desired intensity of grazing that meets land management objectives. Pastures are usually fenced and provided with water to accomplish grazing management objectives.

In the Great Basin of eastern Oregon, season of use is generally keyed to important forage plants, such as bluebunch wheatgrass, and is related to the plant's phenological development. Early spring use starts as grasses begin growth and terminates just before the boot stage of development. Early use lasts until seed maturity. Midseason starts when grasses are in the boot stage and continues to seed maturity. Late use occurs after seed maturity but when the plants still have some green color. Fall use occurs after late use, generally during September and October after grasses have lost color and are essentially dormant. Season-long use generally runs from plant green-up (March or April) to dormancy (September to October), during which time livestock remain in the same pasture for the entire season. Winter use occurs after fall use, from November to initiation of spring growth.

These seasons of use affect plants physiologically in different ways. For example, early spring use, when livestock are removed from the pasture at about the boot stage of grass development, does little physiological damage to the grazed plants if there is enough soil moisture to allow plants to complete development through seed ripening.

On the other hand, midseason use, when grasses are grazed between the boot stage and seed ripening, has the potential of most serious physiological damage, particularly if the grass is bitten off within 1 to 2 in (2.5 to 5 cm) of the ground. In such cases, plants cannot maintain sufficient green leaves to produce adequate energy and nutrient reserves. Most of the energy and nutrients stored from the previous season are used to grow leaves and seedstalks, which cannot replace the expended energy when they are continuously grazed. Also, some nutrients must be stored in the root crowns for initiation of growth the next growing season. Close grazing not only reduces leaf surface but also prevents flowering, the physiological trigger that transfers available nutrients to root storage. Bluebunch wheatgrass can be killed in 3 to 5 years if it is reduced to a 1 to 2 in (2.5 to 5 cm) stubble during this phenological stage. Winter use, even when plants are grazed to a 1 to 2 in stubble, seldom damages the plants physiologically. This stubble provides little protection for crown of the grass, however. Severe low temperatures with lack of snow cover can damage the plants. Grazing systems, therefore, have two objectives: to maintain or enhance plant vigor that is governed by season and closeness of use and to produce an optimum amount of livestock gain that is accomplished by good distribution of livestock and careful regulation of forage utilization.

Grazing systems vary in complexity, from season-long grazing in a single pasture to high-intensity, short duration, repeated grazing in five or more pastures (such as Savory's holistic management concept) (Walter 1984). The following discussion applies to cattle and unherded sheep, but any of the grazing systems can be applied to herded sheep on unfenced rangeland. The number of pastures, and therefore the amount of fence and the number of water developments, depends on the grazing system used.

Season-long grazing requires one pasture and enough water, generally within less than 3 mi (5.8 km), to maintain the livestock for a grazing season. Livestock are introduced in the spring and removed in the fall. Distribution is attained by placement of salt and water, or herding. In areas where western juniper occurs, thermal cover (shade) can be almost as important as water for influencing livestock distribution.

If livestock are not grazed season-long, they are most commonly moved (rotated) between two or more pastures. Rotation grazing can be divided into three kinds: deferred, rest, and high-intensity-frequent rotation.

Deferred rotation means that an entire range area is grazed every year, but some parts are deferred from grazing during some portion of the growth period of key forage species. In its simplest form, this is a two-unit system where pasture A is grazed early, during active growth in the spring and early summer and pasture B is deferred from use. Sometime about midsummer, livestock are transferred to pasture B for late season use after forage plants have begun to mature: The next year, livestock graze early in pasture B and at midsummer are moved to pasture A.

Rest rotation requires that a certain proportion of the range area be rested completely from grazing for a whole year on a scheduled basis (fig. 4). In its simplest form, three pastures are required: pasture A is grazed during the first half of the season, livestock are moved to pasture B for the second half of the season, and pasture C is rested the entire grazing season. The next year, pasture B is grazed in the spring of the year, pasture C is grazed in the fall of the year, and pasture A is completely rested. The third year pasture C is grazed in the spring of the year, pasture A in the fall of the year, and pasture B is rested.

A third system involves high-intensity, short duration, repeated grazing developed by Savory (holistic management concept) (Walter 1984). Attention must focus on closeness of use, soil surface disturbance, and management objectives. "High intensity" does not always mean close use. Instead it means high *management* intensity in which livestock are moved when grazing on key vegetation and impacts on the soil surface reach the level specified for the pasture. In its simplest form: pasture A is grazed in the spring until use standards are met. Then livestock are moved in sequence to pastures B, C, D, and E. The time to move livestock is de-' termined by the use level on key vegetation, degree of soil disturbance, and management objectives. Length of time in each pasture is governed by forage production and soil surface conditions. After pasture A has regrown enough to provide sufficient forage, livestock may be returned to it and may be subsequently rotated through the several pastures during the grazing season. Under this concept, most of the range area is grazed every year, often more than once. Intensity of use is adjusted according to physiological requirements of the plants and land management objectives.

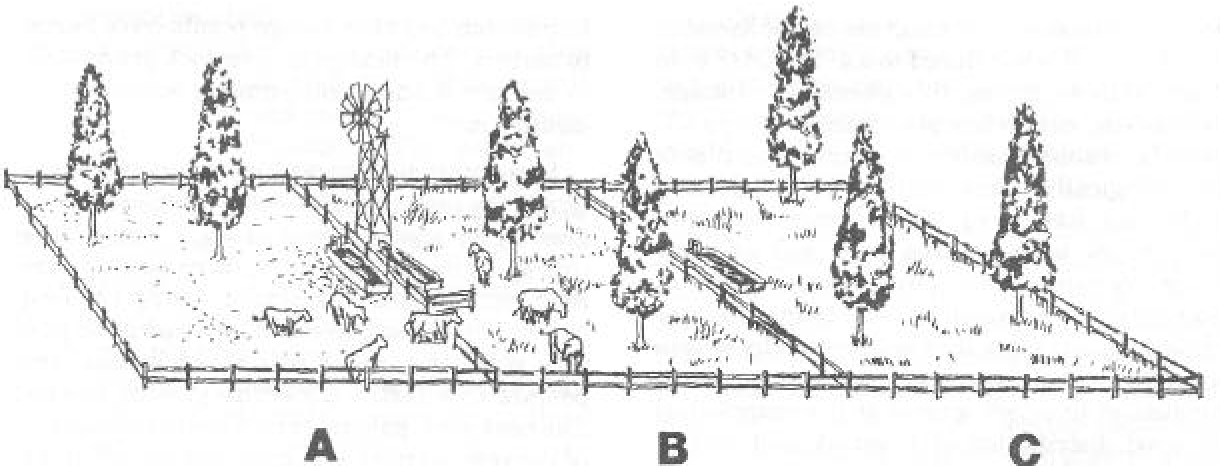

Figure 4.—One system for grazing livestock is a three-pasture, rest-rotation program. Livestock are concentrated in one pasture (A) during the first half of the grazing season, then moved to a second pasture (B). The third pasture (C) is rested for the entire season. The next year, the sequence of pastures is rotated so that a new area is rested the entire year.

1st year: Pasture A is grazed from June 1 to August 15; pasture B, from August 15 to October 30; pasture C is rested the entire year.
2nd year: B, grazed June 1 to August 15; C, grazed August 15 to October 30; A, rested entire year.
3rd year: C, grazed June 1 to August 15; A, grazed August 15 to October 30; B, rested entire year.
4th year: Repeat cycle, starting with A.

CLOSENESS OF FORAGE USE

Deferred rotation, rest rotation, and high intensity-short duration grazing systems have one thing in common-close use of vegetation in pastures being grazed. All systems concentrate livestock in a relatively small tract where preferred grazing areas are quickly cropped to a stubble of 1 to 2 in (2.5 to 5 cm). The animals must then graze farther from water in less preferred areas. Vegetation near water is expected to be closely grazed. One objective of these systems is forced distribution of livestock so more of the total area can be grazed. Another objective is deferred use of plants on some portion of the area to restore their vigor.

This concentration of livestock and their close use of vegetation have impacts on wildlife; these impacts will be discussed later for each of the species featured in previous chapters. Grazing by livestock can be advantageous or disadvantageous to wildlife depending on species and circumstances. For example, a 1 to 2 in (2.5 to 5 cm) stubble is roughly equivalent to bare ground for wildlife that nest and feed on the ground. On the other hand, seasonal grazing by livestock removes old grass called "rough" and exposes regrowth of lush green grasses often heavily used by mule deer. A 6 in (15 cm) stubble may be as adequate as ungrazed bunchgrass for ground-dwelling wildlife.

Close use of vegetation by livestock does more than influence wildlife and wildlife habitat. It can affect plant species composition and density of the herbaceous layer. Repeated, close use to 1- to 2-in (2.5 to 5 cm) stubble during the growing season results in a decrease of bunchgrasses. This downward trend results in a midseral or an early seral condition characterized by dominance of the annual cheatgrass brome. On poor soils, the result may be essentially bare ground. But the midseral or even the early seral condition is not detrimental to all wildlife. For example, figure 5 (Maser et al. 1984) suggests that a greater number of

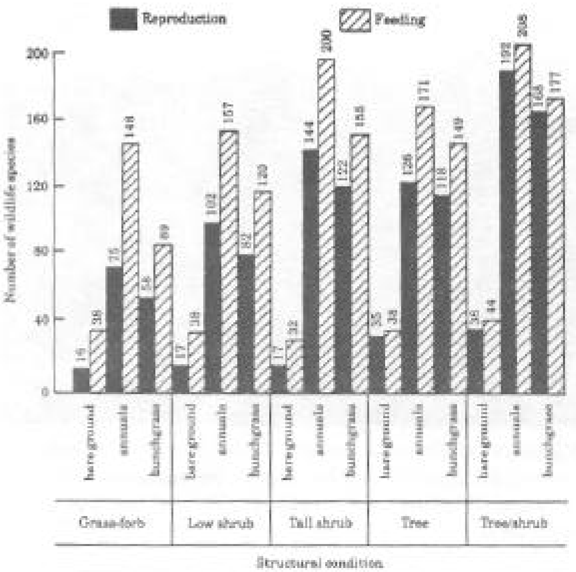

Figure 5.—Number of wildlife species oriented to esert-steppe structural conditions and the potential effect of intensive management (reproduced from Maser et al. 1984).

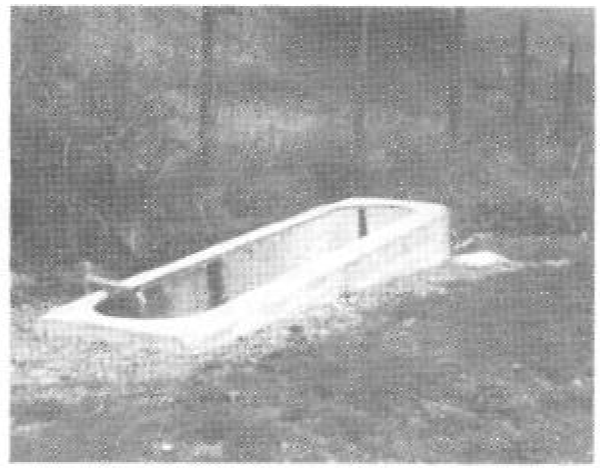

Figure 6.—Many water developments in the Great Basin are not natural. Well-placed water is the best means for obtaining good livestock distribution; however, these manmade water developments are of little benefit for wildlife if water is not maintained while wildlife are in the area. In this example, an electric pump would be needed to supply water. (Photograph courtesy of Chris Maser.)

wildlife species both reproduce and feed when annuals are dominant in the grass-forb, low shrub, tall shrub, tree, and tree/shrub structural conditions.

FENCES AND WATER

Livestock distribution is achieved primarily by means of fencing, water development, salt location, and maintenance of thermal cover where juniper or tall shrubs occur. Cattle will scatter over ranges with gentle topography when water is no farther than 2 mi (3.2 km) apart. In the Great Basin, natural water sources are seldom found this close together; therefore, additional sources of water are often developed. If wildlife enhancement is a management objective, these water sources should remain available throughout the season. This may be expensive if water is hauled or supplied by electric pump (fig. 6).

Fencing is the primary means by which livestock are contained within a specified area. Fences have significant impacts on wildlife movement, particularly pronghorns and bighorn sheep. A smooth wire at least 16 in (41 cm) above the ground and a top wire no higher than 36 in (92 cm) have the least impact on movement of pronghorns; for bighorn sheep, a smooth wire 20 in (51 cm) above the ground and a top wire no higher than 39 in (100 cm) have the least impact. A general recommendation is a smooth bottom wire 20 in (51 cm) above the ground, a top barbed wire no higher than 36 in (92 cm), and a third barbed wire between the other two wires. If steel fenceposts are used, their tops should be painted white to enhance visibility. Making the fence obvious is important in preventing collisions by wild ungulates and birds, such as sage grouse.

In many areas, soils are too stony and shallow to allow steel fenceposts to be easily driven into the ground. Fences in such situations are commonly constructed from rockjacks or rockcairns (fig. 7). Such fences can provide habitat attributes for some wildlife species. For example, rockjacks can provide cover and dens for small animals, particularly with a 4 to 6 in (10 to 15 cm) gap between the ground and the bottom of the rockjack. Rocks greater than 12 in (31 cm) in diameter provide large enough crevasses for several species of wildlife (Maser et al. 1979).

Figure 7.-Fences are the second most important means for controlling livestock. On soils too shallow to support steel fenceposts, rockjacks are used for stability.

VEGETATION TREATMENT

When land is managed primarily for livestock production, the principal reason for manipulating vegetation is to increase forage for livestock. In the Great Basin, this often entails killing or removing shrubs, trees, or both to reduce competition with grass. Where sites are in the late seral or the PNC condition, control of woody species allows native grasses and forbs more nutrients, moisture, and sunlight. With these nutrients, they will be more productive and will provide additional forage for livestock.

When such sites are in the midseral or the early seral condition, not enough bunchgrasses remain to provide adequate forage, so the area is often seeded to crested or fairway crested wheatgrass. On a Wyoming big sagebrush site dominated by sagebrush, for example, the midseral condition may produce only 200 lb/acre (224 kg/ha) of forage in the form of cheatgrass brome and Sandberg's bluegrass. With shrub control and successful seeding of crested wheatgrass, forage production can be increased to 900 to 1,100 lb/acre (1010 to 1235 kg/ha).

The method of vegetation manipulation influences structure and dominance of plants after treatment. For example, burning, whether natural or prescribed, not only kills woody plants but also eliminates their structure from the stand. It may enhance habitat for a number of wildlife species. Mule deer and pronghorns often select recently burned areas for feeding (Leckenby et al. 1982, Kindschy et al. 1982). On the other hand, chemical control of shrubs has two significantly different after effects. First, the dead shrubs remain, and they often retain the shrub structure that does not enhance the areas for such species as the horned lark and bighorn sheep. Second, chemicals that kill the shrubs, such as 2,4-D, also kill forbs. Forbs are part of the staple diet for sage grouse (Call and Maser 1985) and pronghorns (Kindschy et al. 1982). Mechanical treatment of woody vegetation. has intermediate effects on wildlife. For example, chaining changes the structure from tree/shrub or shrub to grassland but leaves residue on the ground that creates microhabitat for small animals (Maser et al. 1979).

The consideration of edges by managers when they are planning treatments to vegetation can have important ramifications for wildlife (Thomas et al. 1979). In general, some treatment of large, homogeneous tracts is advantageous to wildlife, such as mule deer (Leckenby et al. 1982) and pronghorns (Kindschy et al. 1982) (fig. 8). On the other hand, heterogeneous vegetative complexes composed of natural grassland, low shrub, tall shrub, and tree/shrub communities may already be close to optimum in terms of habitat diversity and wildlife. Manipulation of vegetation could cause simplification of vegetative structure and thus reduce diversity (fig. 9).

Figure 8.—In some plant communities, such as Wyoming big sagebrush, herbage production for livestock can be greatly increased by seeding crested wheatgrass after sagebrush is controlled. Interspersion of revegetated tracts in a homogeneous tract of sagebrush can enhance wildlife habitat by creating edges and introducing different stand structure and thus increasing wildlife diversity.

Figure 9.—An area with good natural diversity of plant communities: quaking aspen, meadow, Wyoming big sagebrush, and low sagebrush ridges. Revegetation on the hills adjacent to the aspen and meadow might increase herbage production but might not enhance vegetation diversity to the advantage of wildlife.

It is not possible to deal with all wildlife species of the Great Basin here; however, the wildlife species featured in other chapters in this series are discussed in relation to livestock management. This discussion shows how wildlife can be considered in relation to management of livestock grazing.

Featured Species and Grazing

Habitat characteristics have been summarized from the chapters in this series that deal with the following species: native trout (Bowers et al. 1979), sage grouse (Call and Maser 1985), pronghorns (Kindschy et al. 1982), mule deer (Leckenby et al. 1982), and bighorn sheep (Van Dyke et al. 1983).

NATIVE TROUT

Livestock impacts on native trout occur primarily in riparian areas. Optimum habitat for native trout has the following characteristics: water temperatures less than 70°F (21°C), stable streambanks, minimum sedimentation, and adequate instream or streambank cover. Streamside vegetation is particularly important as it provides shade that reduces water temperature, produces leaves that fall into the stream for primary and secondary reducers, both of which are food for trout, and provides habitat for other insects that can be eaten by trout. In addition, abundant streambank vegetation reduces erosion and thus minimizes siltation over spawning gravel. Instream cover, such as boulders, is also important, but overhanging vegetation along the streambanks more than 2 ft (0.6 m) above the water can effectively replace instream cover (fig. 10).

Figure 10.—Stream edge in the riparian area healing from past heavy use by livestock. In many cases, light to moderate use, such as leaving a 4 in (10 cm) stubble, is compatible with enhancement of the riparian vegetation. (Photograph courtesy of Oregon Department of Fish and Wildlife.)

Livestock use in riparian areas can affect trout habitat in several ways. As cattle travel to and from water, they can break overhanging streambanks that partially shade the stream. Close cropping of forbs and grasses by cattle reduces vegetation along the streambank, and often prevents or eliminates woody vegetation that can provide shade to the stream system. Some studies, in the Great Basin area and elsewhere, have demonstrated a twofold to threefold increase in trout biomass, with livestock use controlled enough to permit banks to build an overhang and woody vegetation to colonize and grow along the streambank (Bowers et al. 1979).

Intensity of livestock use is apparently the key to maintaining or enhancing native trout habitat. When vegetation is grazed to a 1 to 2 in (2.5 to 5 cm) stubble for extended periods, establishment and growth of woody vegetation are inhibited and overhanging banks do not develop. Such stubble heights are common in deferred and rest rotation grazing systems because livestock are grazed in sufficient numbers to force use away from the riparian areas onto less palatable dryland forage. Light to moderate livestock use, leaving a 4 to 6 in (10 to 15 cm) stubble, appears compatible with protection of the riparian area and native trout habitat.

SAGE GROUSE

Sage grouse depend almost entirely on areas dominated by sagebrush for habitat. They prefer level to low, rolling topography with slopes generally less than 30 percent. Some sage grouse migrate from lower to higher elevations after forbs develop, though they remain mainly in sagebrush-dominated areas. Their movements are strongly influenced by the availability of free water; they therefore have strong affinities for riparian areas. Breeding occurs in the spring on open areas called leks (fig. 11). These areas are characterized by bare or relatively bare ground and range in size from 10 to 100 acres (4 to 40 ha). Leks are usually adjacent to nesting and brood-rearing habitat.

Figure 11.—Sage grouse strutting on a lek. The lek characteristically has little or no sagebrush and is in early seral to midseral community. It is usually adjacent to nesting areas where sagebrush is essential. (Photograph courtesy of Oregon Department of Fish and Wildlife.)

Optimum nesting habitat is characterized by 20 to 40 percent crown cover of sagebrush ranging from 7 to 30 in (18 to 77 cm) tall. A dense understory of herbaceous vegetation is important; a late seral condition or PNC is near optimum habitat. Close early grazing by livestock is a disadvantage to sage grouse because it reduces cover and availability of forbs important as food during the nesting and brood-rearing seasons.

Brood rearing occurs in sagebrush but requires only 8 to 14 percent crown cover of shrubs shorter than those preferred for nesting habitat. Low sagebrush types are commonly used during brood rearing; an interspersion of openings is considered advantageous. Sage grouse move away from snow-covered areas to lower elevations to spend the winter, during which time they feed almost exclusively on sagebrush leaves. Sage grouse seem to prefer low sagebrush, but when this species is covered with snow they will feed on taller sagebrush species. Sagebrush canopy cover exceeding 15 percent characterizes the best sage grouse winter ranges.

Local knowledge of sage grouse behavior is essential in developing land management plans. Grouse have strong tendencies to use the same lek year after year and the same nesting and brood-rearing areas. Almost any vegetation treatment within 2 mi (3.2 km) of a lek can have detrimental effects on sage grouse welfare. Therefore, the land manager should determine the location of all leks that are to be maintained as part of the management plan.

This does not, however, preclude some manipulation of vegetation within occupied sage grouse ranges. For example, sage grouse will use areas with sagebrush below the preferred 20 to 40 percent crown cover. Some treatment of sagebrush, such as reducing cover from 40 to 20 percent, may not seriously degrade habitat. Indeed, it might provide for more herbaceous food plants. Sagebrush control in areas with less than 20 percent shrub cover is generally considered detrimental. Treatment of sagebrush might be confined to a few of the most productive sites for livestock forage and adequate stands be left between treated areas.

New leks might be developed by removing sagebrush, provided they are adjacent to good nesting and brood-rearing habitat. Sagebrush can be removed from 10 to 100 acre (4 to 40 ha) tracts on sites in midseral and early seral conditions that would provide minimum ground vegetation. These leks can be made additionally attractive if free water is provided nearby.

Intensity of livestock use can affect the success of sage grouse nesting and brood rearing. Nesting requires both sagebrush cover and herbaceous plants. Therefore, grazing to a 1 to 2 in (2.5 to 5 cm) stubble during these activities is detrimental. Such close grazing will result in significant use of spring forbs by livestock; these forbs are a key element in the grouse diet. If management of sage grouse is an objective, the land manager might consider grazing livestock to leave a 4 to 6 in (10 to 15 cm) stubble. This will provide some cover and also provide sufficient forbs for spring use by nesting and brood-rearing grouse.

When vegetation in sage grouse habitat is treated, special concern should be directed toward use of chemicals, such as 2,4-D. Chemicals kill sagebrush and thus eliminate sagebrush forage for the grouse and reduce hiding cover. In addition, and, perhaps equally important, these same chemicals may kill the forbs that are essential in the spring and early summer diet of sage grouse.

PRONGHORNS

Pronghorns prefer level to gently rolling topography as habitat. Large bodies of water, escarpments, mountains, canyons, and tall shrub or forest areas are barriers to their movements. They require water with a pH less than 9.25 and less than 4,500 p/m of solids. Optimum habitat is about 50 percent crown cover of plants, a significant portion in herbaceous vegetation (fig. 12). They avoid sagebrush areas where the shrubs exceed 20 in (51 cm) in height. Because they are primarily forb eaters, the midseral condition seems optimum. Pronghorns effectively use crested wheatgrass seedings if forbs have been seeded.

Figure 12.—Pronghorns prefer areas with little or no shrub cover and a high proportion of forbs in the herbaceous vegetation. Optimum ecological status is midseral to late seral. Grass seeding can enhance pronghorn habitat if forbs are seeded in the mixture. (Photograph courtesy of Oregon Department of Fish and Wildlife)

A high diversity in plant species composition seems attractive to pronghorns. Extensive tracts of homogeneous shrubland, such as 3,000 + acres (1215 + ha) of Wyoming big sagebrush, are not optimum pronghorn habitat. Habitat can be enhanced by manipulation of vegetation. For example, controlling sagebrush or western juniper on areas less than 1,000 acres (405 ha), and generally, no more than one-third the home range of pronghorns, can be beneficial. In treatment of vegetation, the manager should remember that chemicals may kill desired forbs. Fire can be an effective means of manipulating vegetation to benefit pronghorns. Fire can be prescribed to result in less than 100 percent kill of sagebrush, and it stimulates forbs and enhances palatability of forage. Pronghorns have been observed seeking out burned areas for feeding (Kindschy et al. 1982).

Fencing can be detrimental to pronghorns. Because pronghorns do not commonly jump, the lower wire of a fence should be high enough to permit them to crawl under it. A smooth wire 16 in (41 cm) above the ground is acceptable. The fence should have no stays, and white-topped fenceposts will make the fence more visible to pronghorns. Water developments to enhance livestock distribution can be of significant advantage to pronghorns if they are available when pronghorns occupy the area.

Moderate cattle grazing seems complementary to pronghorns because cows, preferring grasses, leave the forbs for the pronghorn: (Kindschy et al. 1982). Cattle grazing must be controlled if close use of forbs is to be avoided. Some direct competition occurs between domestic sheep and pronghorns because both species feed primarily on forbs. If pronghorn welfare is a primary concern, sheep should not be grazed. If sheep are to be grazed, the closeness of use should be limited to assure that appropriate amounts of forbs remain for the pronghorns. Although close livestock use seems to be detrimental (that is, a 1 to 2 in (2.5 to 5 cm) stubble), moderate livestock use that leaves a 4 to 6 in (10 to 15 cm) stubble, may be complementary to both livestock and pronghorn welfare. Sufficient winter forage should remain for the pronghorns after livestock grazing. Some moderate use may make grasses the pronghorns eat more palatable by removing old rough grass.

MULE DEER

Mule deer use traditional home ranges whether they are migratory, or are year-round residents. For this reason, management relating to mule deer should consider subpopulation areas of about 11,500 acres (4656 ha). Two kinds of social groups are common: does with fawns, and males. Five habitat attributes are important: (1) thermal cover, (2) hiding cover, (3) forage areas (4) fawning habitat, and (5) fawn-rearing habitat. Thermal cover is provided by woody vegetation over 5 ft (1.5 m) tall, with crown cover exceeding 50 percent in tracts at least 2 to 5 acres (0.8 to 2.0 ha). Hiding cover is defined as vegetation greater than 24 in (61 cm) tall that can hide 90 percent of a bedded deer at 150 ft (46 m) or less (fig. 13). Tracts should be at least 600 to 1,200 ft (183 to 366 m) in diameter, which equals 6 to 25 acres (2.5 to 10 ha). Forage areas are defined as tracts where the structure of the vegetation does not meet thermal or hiding cover criteria but does produce forage. Because mule deer have affinities for edges, forage areas should be less than 1,200 ft (366 m) across. Deer and cattle compete for forage; however, moderate cattle use, which removes rough grass, can enhance these areas for deer.

Figure 13.—Mule deer in hiding cover—shrubs tall and dense enough to hide 90 percent of a bedded deer at 150 ft (45.7 m). They have affinity for edges in landscapes with a variety of plant communities and structural conditions. (Photograph courtesy of Oregon Department of Fish and Wildlife.)

Fawning habitat is characterized by shrubs greater than 28 in (72 cm) tall and with more than 40 percent crown cover, is within 160 ft (50 m) of tree cover, has succulent forage, is 5 to 25 acres (2 to 10 ha) in size, and is close to water–within 2000 ft (610 m). This description suggests that riparian areas are optimum habitat. Fawn-rearing habitat is similar to fawning habitat; however, it is desirable to have larger tracts of land with more diverse,

plant communities. The optimum diversity of mule deer habitat is 55 percent in forage area, 20 percent in hiding cover, 10 percent in thermal cover, 10 percent in fawn-rearing habitat, and 5 percent in fawning habitat. Thermal cover is thought to be a critical component. If adjustments in cover are desired, thermal cover should be increased at the expense of other cover.

In treatment of vegetation to enhance mule deer habitat, current vegetative conditions must be considered. Variable topography and a variety of plant communities creating a mosaic of edges, forage areas, and cover enhance mule deer habitat. Extensive tracts of homogeneous vegetation, such as Wyoming big sagebrush, can be significantly improved for mule deer habitat by vegetation treatment; as much as 55 percent of an area can be treated to remove or reduce sagebrush to create forage areas. The key is to select the sites best suited for forage production. Then other characteristics of habitat should be considered such as maintaining widths less than 1,200 ft (366 m) across treated areas, maximizing edges, and providing for sufficient thermal cover. Water should be kept available to mule deer when they are on the area.

Intensity of livestock use can be adjusted to enhance production of forage for mule deer. Moderate use by cattle will remove rough grass and afford deer the opportunity to forage on regrowth or spring growth of grasses protruding above the rough. Livestock grazing should be regulated to ensure only light use of forbs and browse. Close livestock use, which causes a downward range trend, can be detrimental to mule deer range.

BIGHORN SHEEP

Bighorn sheep are very traditional in their occupation of specific ranges, are slow to pioneer new habitats, and are extremely sensitive to disturbance. They prefer remote, rugged, steep terrain with open plant communities that are low in structure. Keen vision is their primary mechanism for detecting danger. They shun forest stands and areas with shrubs more than 2 ft (0.6 m) tall. Key habitat components are open forage areas, escape terrain, water, thermal protection, and traditional lambing and rutting areas (fig. 14).

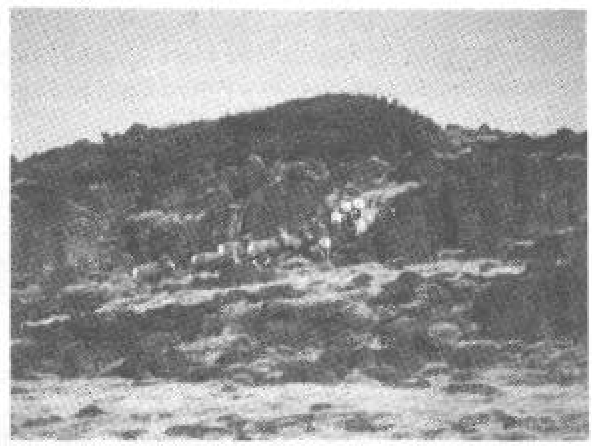

Figure 14.-Bighorn sheep 3n a near ideal setting of a forage area, escape cover, and terrain that significantly limits easy travel by other large animals. They are socially sensitive to domestic livestock and often leave areas grazed by cattle. (Photograph courtesy of Walter A. Van Dyke.)

Presence of escape terrain regulates use of other areas. Such escape terrain is composed of cliffs, rimrock or outcroppings, bluffs, and topographic features most other animals have difficulty negotiating. Thermal protection is often provided by topography and elevation. Bighorn sheep also obtain thermal regulation by bedding in windy or wind-protected areas depending on the circumstances. Forage areas are relatively open with low vegetation, no farther than 0.5 mi (0.8 km) from escape terrain and within 1 mi (1.6 km) of water. Shrubs are mostly less than 2 ft (0.6 m) tall with less than 25 percent crown cover. Lambing areas are traditional; they occur in rugged, precipitous, remote terrain with adequate forage and water. In general, they exceed 5 acres (2 ha) in size. Intrusion by people and competing animals is detrimental. Fresh water with a reasonably low pH is important. Water in summer is of particular value.

Because bighorn sheep are primarily grass eaters, they compete directly with cattle for forage. They will sometimes leave areas grazed by livestock because of their sensitivity to this competition. For enhanced conditions for bighorn sheep, livestock should not be grazed with bighorn sheep; if they are grazed, use should be adjusted to leave sufficient forage for sheep.

Fences are important in controlling livestock, but they may hinder movement of bighorn sheep. Recommended fence construction is a smooth wire 20 in (51 cm) off the ground with a top barbed wire no higher than 39 in (100 cm) above the ground.

Transmittal of diseases between bighorn sheep, cattle, and particularly domestic sheep, sometimes is a problem. Waterholes and salt grounds should not be used by domestic livestock when bighorn sheep are in the area.

Human intrusion into bighorn sheep territory is most detrimental. The sheep have abandoned good habitat because of their low tolerance for humans. Therefore, management should provide for control of people.

These constraints on bighorn sheep habitat seem to imply that no management activities should be carried out on ranges occupied by bighorn sheep. This is not necessarily true. For example, forage areas adjacent to escape terrain and available water may be improved by shrub control. Grasses and forbs can be seeded on ranges depleted of perennial grasses. Water sources can be developed to enhance bighorn sheep range. In general, these improvements should be fenced to exclude livestock if bighorn sheep habitat is to be enhanced to its fullest. If cattle are to graze in bighorn sheep range, they must be carefully controlled as to season and intensity of use to avoid social interaction and forage competition with bighorn sheep.

Management for Species Richness

So far, livestock management has been discussed as it affects several featured species. An alternative or additional wildlife objective is species richness management, in which habitat is manipulated to ensure that all native species remain in viable numbers in the area under management (Maser and Thomas 1983).

Diversity was thoroughly discussed in the chapter of this series on edges (Thomas et al. 1979), which dealt with interspersion, inherent and induced edges, species richness, size of habitat blocks, and contrast in structure of plant communities. Tract management for species richness is based on habitat blocks averaging about 200 acres (81 ha) in size.

The land manager commonly must strike a balance between meeting species richness goals and optimizing habitat for one or several featured species (fig. 15). For example, optimum mule deer habitat has 55 percent of the land in forage areas that is in the grass-forb structural condition (Leckenby et al. 1982). For optimum habitat for pronghorns, only 33 percent of the area need be in a grass-forb structural condition (Kindschy et al. 1982), whereas for sage grouse habitat only 2 percent of the land area need be in a grass-forb structural condition (Call and Maser 1985). Clearly, the land manager cannot manipulate vegetation so as to maximize habitat conditions for mule deer, pronghorns, and sage grouse on the same tract of land. Similarly, the manager cannot maximize species richness and the habitat conditions for a featured species on the same tract at the same time.

The land manager must deal with the interaction of livestock and wildlife. Livestock, with their attendant use of forage, compete directly with some species of wildlife for forage; they create adverse effects for some wildlife through social interactions or produce a complementary situation for some wildlife species, depending on the intensity of livestock grazing and the season of use. Properly done, livestock grazing can enhance mule deer habitat, whereas livestock presence can be an intolerable intrusion on bighorn sheep ranges.

Figure 15.—Diversity in plant communities and stand structure provides for a variety of wildlife habitats and therefore enhances wildlife species richness. Species richness may be enhanced by vegetation treatment in areas with large expanses of homogeneous vegetation. In this case, the best grass growing area has been seeded to crested wheatgrass to create habitat for horned larks, a forage area for pronghorns, and edges for mule deer. (Photograph courtesy of Chris Maser.)

Practices for the simultaneous management of livestock and wildlife in the Great Basin constitute a complex series of tradeoffs involving biology, economics, legal requirements, and social pressures. At least for the present, livestock grazing is the dominant use of the lands in question. The task for the manager, then, is to determine how best to manage livestock and manipulate vegetation in a cost-effective manner for enhanced livestock production, and at the same time provide a minimum detrimental impact on wildlife or, if possible, enhance wildlife habitat. Even if livestock grazing were excluded from public lands in the Great Basin, the resulting circumstances would not provide optimum habitat conditions for featured species or ideal conditions for species richness. For example, very large tracts of climax sagebrush is not optimum habitat for most wildlife species in the Great Basin of southeastern Oregon (Maser et al. 1984). The land manager has a myriad of opportunities and constraints to consider when formulating management objectives and alternatives. In general, no matter what the manager does or does not do, the habitat of some species of wildlife will be enhanced and that of others diminished. It is the clear intent of the law under which public land managers operate (see Maser and Thomas 1983) that these effects be considered and evaluated when management decisions are made. The chapters in this series provide the means to deal with wildlife in the managed rangelands of southeast Oregon.

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Appendix

COMMON AND SCIENTIFIC NAMES

Common name	Scientific name
PLANTS	
Bitterbrush	*Purshia tridentata*
Bluebunch wheatgrass	*Agropyron spicatum*
Cheatgrass brome	*Bromus tectorum*
Crested wheatgrass	*Agropyron desertorum*
Fairway crested wheatgrass	*Agropyron cristatum*
Low sagebrush	*Artemisia arbuscula arbuscula*
Mountain-mahogany	*Cercocarpus ledifolius*
Needle and thread grass	*Stipa comata*
Quaking aspen	*Populus termuloides*
Sagebrush	*Artemisia* spp.
Sandberg's bluegrass	*Poa sandbergii*
Western juniper	*Juniperus occidentalis*
Wheatgrass	*Agropyron* spp.
Wyoming big sagebrush	*Artemisia tridentata wyomingensis*
ANIMALS	
Bighorn sheep	*Ovis canadensis*
Cow	*Bos taurus*
Domestic sheep	*Ovis aries*
Horned lark	*Eremophila alpestris*
Horse	*Equus cabalus*
Mule deer	*Odocoileus hemionus*
Native trout	*Salmo* spp.
Pronghorn	*Antilocarpra americana*
Sage grouse	*Centrocercus urophasianus*

WILDLIFE HABITATS IN MANAGED RANGELANDS
THE GREAT BASIN OF SOUTHEASTERN OREGON

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